ROBERT AUGUST BILLWILLER.

We learn with regret of the death of Prof. Robert August Billwiller on August 14, 1905, at Zurich, Switzerland.

Doctor Billwiller was born August 2, 1849. He studied in Basle, Zurich, Göttingen, and Leipsic. As the outgrowth of his enthusiastic work at the Observatory of Zurich during 1872–1881, where he had, among other things, introduced daily telegraphic reports and forecasts in 1878, there resulted the formation of the Central Meteorological Institute of Switzerland in 1881, with himself as director—an institution that represented the whole Republic—25 annual volumes of its annals have been published. Billwiller also organized the Swiss Alpine Club which, in 1882, established the famous mountain station on the summit of the Säntis, and maintained it until the expense was undertaken by the State. Since 1891 Billwiller has been an active member of the permanent committee of the International Meteorological Congress. His life and influence were devoted to the development of meteorological observations and research.

TORNADO AT CARBONDALE, PA., AUGUST 30, 1905.

Immediately after the tornado of August 30 at Carbondale, Pa., Mr. William M. Dudley, official in charge at Scranton, which is about sixteen miles southwest of Carbondale, issued a circular of inquiry and compiled a description from which we make the following extracts. He also obtained a special report, with photographs, by Mr. F. B. Hamilton. Three of the latter we reproduce. These views show the main points of interest in Dundaff or the western part of Carbondale.

Carbondale, Pa., a town about sixteen miles to the northeast of Scranton, Pa., was visited by a tornado of marked severity at about 8:30 p. m. The funnel-shaped cloud, from which vivid lightning played, moved across the northern portion of the city mostly, but its general course was from the southwest to the northeast, covering a track 2 miles in length and from 25 to 200 yards in width. Most of the damage was done in the northwest and northeast portions of the city. It is estimated that about 30 houses, barns, and sheds were blown down. A number of buildings were unroofed, some roofs being blown as far as 600 feet distant, causing the streets in the path of the storm to be littered with débris. Trees blown down fell to the eastward. From responses to a circular letter issued to the surrounding country, the information is gathered that this storm was confined to Carbondale, Pa., although rain, with high north to west winds and vivid lightning, occurred at a number of points in the vicinity. In most instances the rain was light.

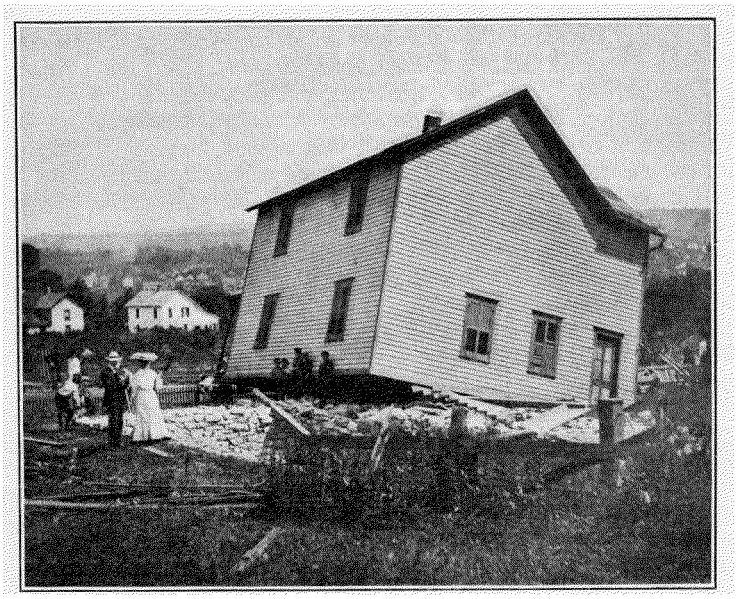

FIG. 1.—This view shows a dwelling situated on a street at right-angles to 42d street. The dwelling was moved in line with the direction of motion of the tornado. The fact that the chimney stands would suggest good construction.

FIG. 2.—This is a front view of the house shown in the preceding figure. The fronts are on the lee side, both buildings have moved in the line of storm travel, both have been moved from their foundations and both have moved toward each other. This suggests the possibility that the storm center may have passed between the houses and moved them inward by suction. The picket fence in the foreground which is overturned consisted of posts set into heavy stone anchors.

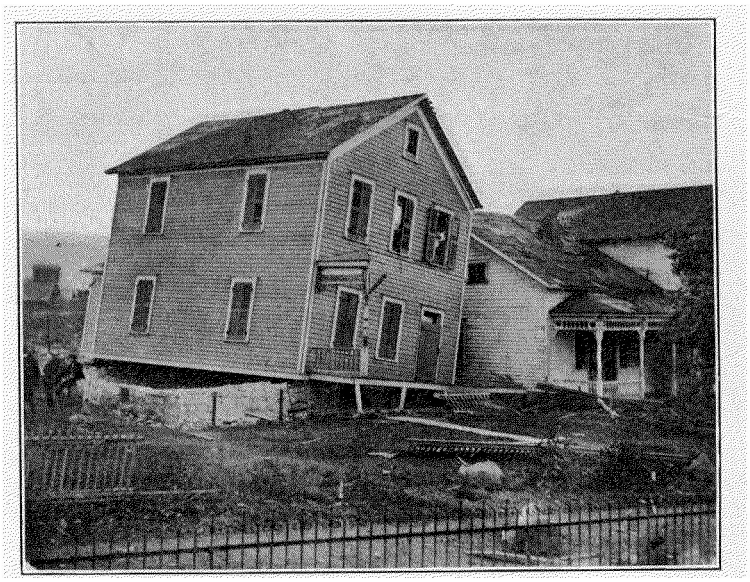

FIG. 3.—This house faces the wind and the view was taken from the side of the house on the opposite side of the street and which was damaged in a manner similar to the house at the right. This might suggest that the tornado had a bounding movement.

At Scranton, Pa., at this time, vivid lightning was observed to the north, and a light sprinkle of rain fell from 8:50 to 9:50 p. m. to the amount of .01 of an inch. No special characteristics were observed here, the barometric pressure at 8 p. m., while low, 29.64 inches, continued even, and there was no noticeable increase in the wind velocity.

Mr. W. S. Bonham, postmaster at Simpson, Pa., just a few miles to the northeast of Carbondale, Pa., writes as follows: "The tornado commenced at Old Saw Mill on Fallbrook Road, one mile west of Carbondale, Pa., tearing it down completely. Then it took an easterly course over a hill to 42d street, tearing down and completely demolishing one house, furniture and all. The storm continued eastward in its track, upsetting and taking off their foundations five or six other houses. Continuing in its eastward track to the Delaware and Hudson and Erie Railroad yards, upsetting loaded cars of coal, tearing off roofs of two box cars and upsetting same; also took roof off company's barn and two Delaware and Hudson offices in yard. The storm then crossed the Lackawanna to the

east side, tearing two barns to pieces, also taking off of foundations two other barns. It then moved to the very northeasterly side of Carbondale, Pa., and tore to pieces one more barn. The path of destruction was about one and three-quarter to two miles in length and about 25 to 200 feet in width. One mile south of Simpson, Pa., the cloud was white, resembling steam somewhat, the top of the cloud being very dark, funnel-shaped, turning backward, or to fully illustrate, it was turning the same way you would turn a brace and bit if you were turning it out or backwards. The electric flashes issued from the funnel cloud. No hail at all, and only a few large drops of water. The noise was very peculiar, sounding like large quantities of water slashing and splashing, and also a heavy rumbling noise. Uprooted trees fell mostly toward the east. No persons or animals killed by the storm. No hail reported at any place in the vicinity."

MOHN'S RESULTS OF NANSEN'S NORTH POLAR WORK.

The results of the Norwegian North Polar Expedition of 1893–1896 organized and led by Fridtjof Nansen are being published in a series of handsome quarto volumes at the expense of the "Fridtjof Nansen Fund for the Advancement of Science." This fund is said to be essentially the money derived by Nansen from his numerous popular lectures in America and Europe and therefore analogous to the "Tyndall Fund" in the United States.

Volume 6 of the series is devoted to meteorology which is considered as No. XVII of the classified list of subjects under which Nansen's scientific observations are being studied. The magnetic, hydrographic, and biological work will undoubtedly be as interesting, if not as important, as the meteorological work. The latter was pecularily favored by the long imprisonment of the *Fram* in the ice, so that we have three years of observation under practically uniform conditions. The observations were carried out with indefatigable industry and faithfulness by Nansen's sailing captain, Sigurd Scott-Hansen, and his assistants, Capt. Hjalmar Johansen and Mr. Bernard Nordahl.

Technical meteorologists will especially appreciate the fact that the material accumulated on this voyage has been prepared for publication and in every respect admirably discussed by Prof. H. Mohn, the eminent director of the meteorological service of Norway. In addition to atmospheric observations proper, hydrography was also included in the scheme of work and the temperature of the sea surface in the open sea, and of the ice at different depths are fully recorded. The temperature of the sea water belongs to volume 3, but the temperature of the polar ice is properly considered as belonging to the meteorological data of volume 6. The journal of observations occupies 225 pages of this volume and is followed by about 400 pages of results, subdivided into chapters on the winds, pressure, temperature, moisture, clouds, precipitation, and fog, and optical phenomena. These are followed by chapters on the general relations of the observations made on the *Fram* to the general distribution of the temperature of the polar ice, the arctic areas of pressure and temperature, the diurnal and annual periods of meteorological elements in the arctic circumpolar sea.

The polar charts of the isotherms, isobars, and isabnormal lines for each month of the year for the Arctic region north of latitude 60° are based upon all data given by polar explorers and therefore replace the older preliminary efforts in that line of study. The chart showing the annual range of air temperature indicates four centers of maximum range, viz, central northern Siberia, central North America, central northern Greenland, and Lapland, where the annual ranges are respectively 66°, 45°, 40°, and 30° centigrade. The hypothetical annual range at the pole itself is 42° and this polar value would doubtless be included within the central north Greenland area whose maximum is 40° if we had a longer series of observations.

The charts of isobars show that the pressure at the pole itself will vary between 762.5 mm. in January, February, March, and April, and 759.0 mm. in June, July, August, and September.

The charts of isotherms show that the mean polar temperature is about —40° C. in January and February, 0° C. in July, —38° in December. The isabnormal line 0° necessarily passes through the pole in each month of the year, the warmer region is on the Atlantic side of the zero isabnormal throughout the year and the colder region lies toward Bering Strait, Alaska, and eastern Siberia also throughout the year.

The annual isotherms show an average temperature of —20° C. throughout the interior of Greenland and the central part of the arctic ice region extending to 15° from the pole toward Bering Strait.

Professor Mohn very properly states that the point of most importance in this whole series of observations is the fact that the surface of the earth during the whole time was of a unique homogeneous nature consisting of a level of frozen water with an uninterrupted free horizon. The distance from continents or islands was always considerable; although there was a change in latitude and longitude, yet the environment of the *Fram* was always so similar that the factors having an influence upon the climate may be regarded as a function mainly of the latitude and only slightly of the longitude. The entire drift of the *Fram* from August, 1893, to April, 1898, included three periods of about four months each of continuous night and also three periods of about four and a half months each of continuous day. These alternations, of course, gave abundant opportunity for distinguishing between the effects of sunshine and terrestrial radiation. In discussing the individual elements, winds, pressure, etc., certain anomalies were discovered as to diurnal and annual periods which could only be elucidated by a consideration of the atmospheric conditions in the whole Arctic region.

Professor Mohn states that the great distance between the *Fram* and any permanent or temporary meteorological station made it quite impossible to construct daily synoptic weather charts by means of which to study the influence of moving cyclonic and anticyclonic systems. He has however utilized the observations on the *Fram* in the light of our knowledge of the laws of cyclonic motion taking account of the coefficient of friction deduced from European observations and has tabulated the resulting computed bearings of the centers of low pressure and their motions. During three years the *Fram* came within the sphere of influence of at least as many as 73 moving areas of low pressure. The maximum number being in January and the minimum in June. The average duration of the passage of a depression was about four days. The lowest pressures at the *Fram* station during the passage, of a depression varied from 771.7 mm., which was the highest, to 724.1 mm., which was the lowest, and both occurred in February. The average heights of the low pressure were a little higher in winter than in summer, which is of course quite a contrast to our experience in the United States, but as the *Fram* was not generally at the center of a low pressure this can only be an approximation to the true average low pressure. There were, however, ten cases in which the center passed over the vessel. Of these the three lowest pressures were 726.0 mm., 727.3 mm., and 728.2 mm. The velocity of the wind observed during the passage of these depressions was not great. The highest being 18 meters per second, or about 40 miles per hour. The average velocity for the whole drift was 4.5 meters per second or 10 miles per hour. Judging from these velocities of the wind the track of the *Fram* can not be considered as a very stormy one. The centers of the depressions moved mostly toward the east-northeast and generally between southeast and northeast, but occasional tracks were toward each point of the compass. There was a preponderance of tracks on the westerly side of the *Fram*. During the first winter they lay chiefly north of the *Fram*, and in the